

CLAIMS

What is claimed is:

1 1. A method for polling and scheduling in a multiuser network that includes a
2 plurality of bandwidth efficient modems, with at least one modem designated as a polling
3 point coordinator access point (AP) element, the method comprising:

4 indicating the beginning of a contention-free period;

5 simultaneously transmitting on a single channel a first set of polling signals, where
6 each polling signal corresponds to a particular terminal included in a first
7 set of terminals included in the network;

8 receiving two or more simultaneous responses from the first set of polled terminals;

9 recovering each of those two or more simultaneous responses using co-channel
10 demodulation capabilities of the AP element; and

11 transmitting clear-to-send messages to any terminals requesting to send data, as
12 indicated by received responses.

1 2. The method of claim 1 wherein the recovering is followed by:
2 simultaneously transmitting acknowledgement signals to responding terminals.

1 3. The method of claim 1 wherein the recovering is followed by:
2 simultaneously transmitting a next set of polling signals to a next set of two or
3 more terminals;
4 receiving two or more simultaneous responses from the next set of polled
5 terminals; and
6 recovering each of those two or more simultaneous responses using co-channel
7 demodulation capabilities of the AP element.

1 4. The method of claim 3 further comprising:
2 repeating the steps of simultaneously transmitting a next set, receiving two or more
3 simultaneous responses from the next set of polled terminals, and
4 recovering each of those two or more simultaneous responses using co-

5 channel demodulation capabilities of the AP element until the end of the
6 contention free period.

1 5. The method of claim 3 wherein simultaneously transmitting a next set of
2 polling signals is preceded by simultaneously transmitting acknowledgement signals to
3 responding terminals.

1 6. The method of claim 1 wherein indicating the beginning of a contention-
2 free period includes transmitting a beacon signal.

1 7. The method of claim 1 wherein the polling signals are generated by the AP
2 element using an optimal phase relationship to facilitate signal recovery.

1 8. The method of claim 1 wherein the responses include at least one of an
2 acknowledgement signal and a request-to-send signal.

1 9. The method of claim 1 wherein transmitting clear-to-send messages to any
2 terminals requesting to send data enables those terminals to simultaneously transmit
3 messages to other terminals in the network after a guard interval.

1 10. The method of claim 1 further comprising:
2 transmitting a message to signal the end of the contention free period.

1 11. The method of claim 1 further comprising:
2 monitoring the channel;
3 transmitting clear-to-send messages to queued terminals when currently
4 transmitting terminals complete data transmission; and
5 in response to no terminals being queued, simultaneously transmitting on a single
6 channel a next set of polling signals.

1 12. A method for polling and scheduling in a multiuser network that includes a
2 plurality of bandwidth efficient modems configured to carry out a distributed coordination
3 function (DCF) for providing best-effort delivery of asynchronous packet data, the method
4 comprising:

5 two or more terminals simultaneously transmitting on a single channel requests-to-
6 send (RTS) messages to a first set of destination modems;
7 simultaneously receiving clear-to-send (CTS) messages from the first set of
8 destination modems at each of the requesting-to-send modems;
9 recovering each corresponding CTS message using co-channel demodulation
10 capabilities of the corresponding requesting modem;
11 each requesting modem simultaneously transmitting its respective data on to the
12 network; and
13 each corresponding destination modem recovering the corresponding data using its
14 co-channel demodulation capabilities.

1 13. The method of claim 12 further comprising the preliminary steps:
2 each modem detecting that one or more of the other modems included in the
3 network are bandwidth efficient and therefore capable of an aggressive
4 access protocol that exploits co-channel demodulation capabilities; and
5 switching from a legacy protocol mode to the bandwidth efficient aggressive access
6 protocol mode for at least one pair of communicating modems included in
7 the network.

1 14. The method of claim 12 comprising:
2 each modem adaptively learning modes of operation which each particular modem
3 in the network is capable; and
4 storing the learned modes operation.

1 15. The method of claim 14 wherein the learned modes of operation include a
2 legacy protocol mode and a bandwidth efficient aggressive access protocol mode that
3 exploits co-channel demodulation capabilities.

1 16. The method of claim 12 further comprising:
2 repeating the steps of simultaneously transmitting requests-to-send (RTS)
3 messages, simultaneously receiving clear-to-send (CTS) messages,
4 recovering each corresponding CTS message, simultaneously transmitting

5 respective data on to the network, and recovering the corresponding data for
6 one or more next sets of destination modems.

1 17. A modem which enables efficient use of bandwidth in a multiuser wireless
2 network including a plurality of modems in the presence of interference and noise, the
3 modem comprising:

4 a multiuser detection module adapted to simultaneously demodulate and recover K
5 wirelessly transmitted signals using co-channel demodulation;

6 a data formatting module operatively coupled to the multiuser detection module,
7 and adapted to produce network data packets for at least one of the K
8 recovered signals;

9 a control processor operatively coupled to the formatting module, and adapted to
10 detect with which protocol mode the at least one of the K recovered signals
11 was transmitted, and to enable a corresponding transmission mode
12 including one of a legacy protocol mode and a bandwidth efficient
13 aggressive access protocol mode that exploits co-channel demodulation
14 capabilities of the modem; and

15 a demultiplexer operatively coupled to the data formatting module and the control
16 processor, and adapted to select one of the recovered K wirelessly
17 transmitted signals as a target signal intended for a user associated with the
18 modem, where the selection is based on a control input from the control
19 processor.

1 18. The modem of claim 17 further comprising:

2 a front end adapted to simultaneously receive the K wirelessly transmitted signals,
3 and to provide those signals in a form that facilitates their subsequent
4 processing by the multiuser detection module.

1 19. The modem of claim 17 wherein the data formatting module supports
2 multiple types of format modes, and the control processor is configured to select a
3 formatting mode in which the data formatting module operates.

1 20. The modem of claim 17 wherein in response to the control processor
2 knowing that a modem with which it is communicating does not support the bandwidth
3 efficient aggressive access protocol mode, the control processor is further adapted to
4 enable a legacy protocol mode there by providing backwards compatibility.

1 21. A method for polling and scheduling in a multiuser network that includes
2 three or more bandwidth efficient modems, with at least one modem designated as a
3 polling point coordinator access point (AP) element that operates as a global timer, the
4 method comprising:

5 receiving a beacon signal from the AP element that indicates frame start, the frame
6 having an interval;

7 monitoring current broadcasting activity of other modems included in the network
8 so as to identify an open slot available for data transmission in a channel,
9 where two or more modems can transmit in the channel at the same time;
10 and

11 in response to identifying an open slot and being next in a transmission queue,
12 transmitting data in the open slot.

1 22. The modem of claim 21 wherein the transmission queue is based on a round
2 robin scheme, where each modem included in the network is assigned a transmission
3 priority.

1 23. The modem of claim 21 wherein the transmission queue is based on priority
2 information included in the beacon signal.

1 24. The modem of claim 21 wherein the monitoring and transmission steps are
2 repeated until a global signal to end the frame is received from the AP element.